

SEASONAL PREVALENCE OF ARTHROPODA AND HELMINTH PARASITES IN SHEEP (*OVIS ARIES*)

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Abstract: The present investigation was carried out to determine the prevalence of arthropoda and helminth parasites in sheep at Azimpur, Dhaka during February, 2012 to January, 2013. A Total of 60 hosts were examined and about 71.67% sheep were found to be infested with arthropod parasites. In sheep two species of arthropod parasites, *Linognathus vituli* (61.67%) and *Damalinia caprae* (68.33%) were identified as ecto-parasites. The prevalence of ectoparasites was higher during summer (85%), followed by winter (75%) and rainy (55%). The higher intensity was also recorded in summer (325.17±1.92). Lambs were found more susceptible (85.71%) than adult (80.95%) and young (56%) sheep and higher in female (77.27%) than in male (68.42%). Twelve species of helminth parasites were identified, of them, 3 trematodes, 3 cestodes and 6 nematodes, highest prevalence was shown by *Strongyloides* sp (71.67%) and lowest by *Dictyocaulus* sp. (3.33%); found comparatively higher in adults (85.71%) than in young (80%) and 28% in lambs. The male sheeps were more susceptible (81.58%) to helminth infection than female (72.73%). Prevalence of helminthes was found higher in winter (95%) season. The value of co-efficient of correlation between the prevalence and intensity of infestation of ectoparasites and helminth parasites in sheep were 0.95 and 0.978 respectively. In both cases these two variables differed significantly ($P < 0.01$).

Key words: Infestation, sheep, arthropods, helminthes, seasons.

INTRODUCTION

The economy of Bangladesh largely depends on agriculture; livestock and about 80% people of the country are directly or indirectly depend on agriculture (Bhuyan 1978). With an annual growth rate of over 8% since 1993, the contribution of the livestock sub-sector to GDP is 3.2% (DLS 2012). Shortage of livestock products is attributing to the prevalence of diseases. Sheep (*Ovis aries*), a member of the family Bovidae and sub family Caprinae, is one of the oldest domesticated animal. In tropics sheep are essentially valuable for meat production (Devendra and Coop 1982). Sheep's meat (mutton) might be an additional source of protein as sheep give 5,000 metric tons meat per year in Bangladesh (BBS 2001).

Sheep are infested by many types of parasites in our country (Islam, 1989). Ectoparasite infestation is one of the major veterinary problems affecting livestock industries in many parts of the world. Ectoparasites including lice, ticks, mites etc. play an important role in transmission of certain pathogens and

known to cause heavy economic loss to livestock industry due to their usual habit of sucking blood, which adversely affects the economic development. Among ectoparasites, ticks have been recognized as a notorious threat due to severe irritation, blood loss, allergy and toxicosis. (Niyonzema and Kiltz 1986). In some cases ticks have been reported to cause lower productivity, mortality and transmit diseases such as theileriosis, babesiosis etc. (Norval et al. 1984).

Sheep are infested with various ectoparasites, among them remarkable prevalence was recorded in case of *Damalinia ovis* (58.8%) in Iran (Yakhchali and Hosseine 2006). Most common species of tick spread almost throughout the world was *Haemaphysalis bipinosa* infesting sheep in the state of Tamil Nadu, India (Latha et al. 2004). Chhabra et al. (1988) recorded 15.9% sheep infested with ectoparasites among them *Haemaphysalis* spp. (2.6%) and *Boophilus microplus* (0.8%) were recorded.

Adesh et al. (2007) identified 2 species of tick (*Boophilus microplus*, *Haemaphysalis bipinosa*, biting lice (*Damalinia ovis*) and sucking lice (*Linognathus pedulis*) in Himalayan region of Uttarkand, India. Clark and Milne (2003) recorded 30% sheep infested with *Psoroptes ovis* in Scottish farm. The lice infestation decreases vigor and lower reproductive capacity of the animals. This type of infestation causes a great economic loss to animal owners through disease and death. Heavy louse infestation may cause pruritus, alopecia, excoriation and self-wounding (Wall and Shearer 1997). In recent years hide damage caused by lice has been increasingly recognized as a significant effect of lice infestations.

Among gastro-intestinal parasites, cestodes found in gut are acquired by eating contaminated food or water found to be largely affecting the ruminants like sheep. This group comprises of the genera *Moniezia* sp., and *Taenia* sp., commonly found in domesticated and wild carnivores and herbivores. Trematodes, commonly live in the bile duct of sheep, goat or in the small intestine and may also infect lungs. Trematodes especially include *Fasciola* spp., *Schistosoma* sp., *aromphistomum* sp. etc. Fascioliasis is a well known parasitic disease of various herbivorous animals. A large variety of animals such as cattle, buffalo, sheep, goat etc. show infection rate that varies from 70% to 90% in some areas.

The clinical symptoms are weight loss, reduced food intake, diarrhea, and reduced yield. Severe blood and protein loss in intestine due to damage caused by parasites often results in oedema in sub-mandible region. *Heamonchus* sp. is most pathogenic among blood sucking worms and infection with this parasite often results in severe anemia in the host *Schistosoma* sp. is the only trematode living in the blood stream of warm blooded hosts. *Schistosoma* sp. cause disease

called schistosomiasis or Bilharziasis and it is one of the main helminth diseases, goat or sheep are infected, over 200 million people are infected in at least 75 countries with 500 million people exposed to infection. *Schistosoma japonicum*, *S. bovis* are mainly found among sheep and goat.

Trichostrongyliasis is a disease occurs in gastro-intestinal tract of cattle, sheep, goat and other herbivorous animals. Filariform larvae of *Strongyloides stercoralis*. *Gnathostoma spinigerrum* can generally be found in wet tropical environments. *Dicrocoelium* is another species which is also found among herbivorous animals. Among roundworms of sheep the commonest are *Trichostrongylus* sp., hookworms, *Ascaris* sp., *Strongyloides* sp. The heavy infection of the worms numbering from 250-400 may lead to loss of about 268ml blood per day from the host body. FAO (1962) reported that losses from intestinal parasites might be as high as 30% of the market value. Afazuddin (1985) estimated an annual loss of taka 0.1 million due to parasite infection in Savar, Military farm, Dhaka.

The overall occurrence of ectoparasites and parasites of digestive system and their variation in relation to age and sex of sheep and their seasonal dynamics was not studied adequately. From this point of view, the current study was conducted to study the occurrence of ecto and endoparasites of indigenous sheep with their seasonal dynamics and variation in the occurrence of parasites in relation to age and sex of sheep. The present study might also prove as a roadmap for future researchers.

MATERIAL AND METHODS

The study took place on sheep at Azimpur area of Dhaka city. The present investigation was carried out during the period of February, 2012 to January, 2013, which covered the winter (January and February), the summer (March to June) and the rainy (July to October) season. Fresh fecal samples collected in the morning and then brought to the parasitology laboratory of Zoology Department, University Of Dhaka to conduct the study.

Hosts: A total of 60 hosts were selected randomly. The minimum age of the sheep was 6 months and the age had been determined according to birth record. To study the relationship between parasite infestation and the age of the host, the sheep were categorized into three groups: lamb (≤ 1 year), young ($> 1-2$ years) and adult (≥ 2 years). During collection of fecal samples the age, sex, place, body condition and season of the year were carefully recorded.

Collection and identification of ectoparasites: The ectoparasites were collected carefully from different parts of the body of sheep with forceps. In some cases small hairbrush dipped in ethanol was used for the collection of ectoparasites.

Morphology or external feature of the arthropod parasites was studied in the laboratory by dissecting ($\times 4$) microscope and compound ($\times 10$) microscope. The ectoparasites were preserved in 70% alcohol in clean well-stoppered glass vials. Vials were labeled properly. Ectoparasites were identified with the help of keys and descriptions given by Soulsby (1982), Roberts (1952) and Wall and Shearer (1997) by making permanent slides by following the procedures described by Cable (1957).

Collection and preservation of fecal sample: Fecal samples of sheep were collected randomly. Fresh samples were collected from 8.00 a.m. to 10.00 a.m. and twice in a month. The feces were picked up in air tied polythene bag to the laboratory of Department of Zoology, University of Dhaka. The polybags were labeled properly. During collection all necessary precautions were taken including wearing apron, hand gloves to avoid contamination. The fecal samples were preserved in 10% formalin.

Examination of fecal sample: Concentration method: In present study, concentration method was used to study gastrointestinal parasites of sheep (Cheesbrough, 1987). This method provides high concentration of parasites and which is relatively free of contaminating particulate materials. Eggs of various gastrointestinal parasites were identified with the help of compound (10 \times) microscope. The 40x objective was also used for the confirmation of ova, larvae (non- motile) and cysts.

Calculation of Egg per Gram (EPG): The number of eggs or cysts per gram of feces was calculated by the drop count from the following formula:

$$N = SS \times P/TD \quad \text{Where,}$$

SS = Total drops of the sub sample

P = Number of parasite (egg or cyst) observed

TD = Total number of drops examined

Terminology: All the terminologies used in the current study were according to standard methodology.

RESULTS AND DISCUSSION

Among hosts examined, 71.67% sheep were found to be infested with arthropod parasites. Two species of ecto-parasites were detected from the infested hosts, namely: sucking lice, *Linognathus vituli* (61.67%) and biting lice, *Damalinia caprae* (68.33%) [Table 1]. *Linognathus vituli* found on Tail, neck, ventral abdominal wall and other parts of the body, whereas, *Damalinia caprae* collected from Ear, neck, abdominal region and hind part of the body.

Seasonal prevalence of ectoparasites in sheep: In summer, (85%), found to be infested with arthropod parasites, during monsoon 55%, and in winter season 75% were infested with ectoparasites. The intensity of ectoparasites were (325.18±1.54), (293.09 ±1.92) and (323.73±0.39) in summer, rainy season and winter respectively. During summer, prevalence of lice was higher in case of *Damalinia caprae* (60%), in rainy season higher prevalence were found in case of *Linognathus vituli* (35%) and prevalence of *Damalinia caprae* was higher in winter season (45%) (Table 1).

Age related prevalence of ectoparasites in sheep: The prevalence of ectoparasites was relatively higher in lambs (85.71%) followed by adult (80.95%) and young (56%) [Table 2]

Table 1. Prevalence of arthropod parasites and helminths in sheep in different season.

Season	No. of hosts infested	Prevalence of ectoparasites (%)	No. of total parasites	Intensity ±SD	Prevalence (%) of helminths	Total of EPG	Intensity of helminths
Summer	17	85	5528	325.18±1.54	80	4800	300
Rainy	11	55	3224	293.09±1.92	60	2680	223.33
Winter	15	75	4856	323.73±0.39	95	7956	418.74

Table 2. Overall prevalence of ectoparasites and helminths in different age groups of sheep.

No. of sheep examined	Age of sheep	No. of sheep infested with ectoparasites	Prevalence (%) of ectoparasites	No. of hosts infected by helminths	Prevalence (%) of helminths
14	Lambs (≤1 year)	12	85.71	9	64.28
25	Young (>1-2 years)	14	56	20	80
21	Adult (≥2 years)	17	80.95	18	85.71

Prevalence of ectoparasites in sheep: The female were more susceptible than male to arthropod parasite infestation. 68.42% male and 77.27% female were found to be positive for ectoparasite infestation. Prevalence of *Linognathus vituli* was higher in female (72.27%) and prevalence of *Damalinia caprae* was higher in male (68.24).

Prevalence of gastro-intestinal helminth parasites in sheep: Out of 60 sheep examined, 47 were found infected with different species of endoparasites (78.33%); 12 species of parasites were identified in sheep; among 47 infected hosts, 48.33% were found infected with trematodes, 53.33% with cestodes and 76.67% were infected with nematodes species (Table 3).

Among trematode parasitic species, highest prevalence was recorded for *Fasciola hepatica* (43.33%), followed by *Schistosoma bovis* (38.33%) and *Dicrocoelium* sp. (11.67%). The standard deviation was highest in case of *Schistosoma bovis* (±115.47), followed by *Fasciola hepatica* (±57.33).

Table 3. Prevalence of gastro-intestinal helminth parasite species in sheep.

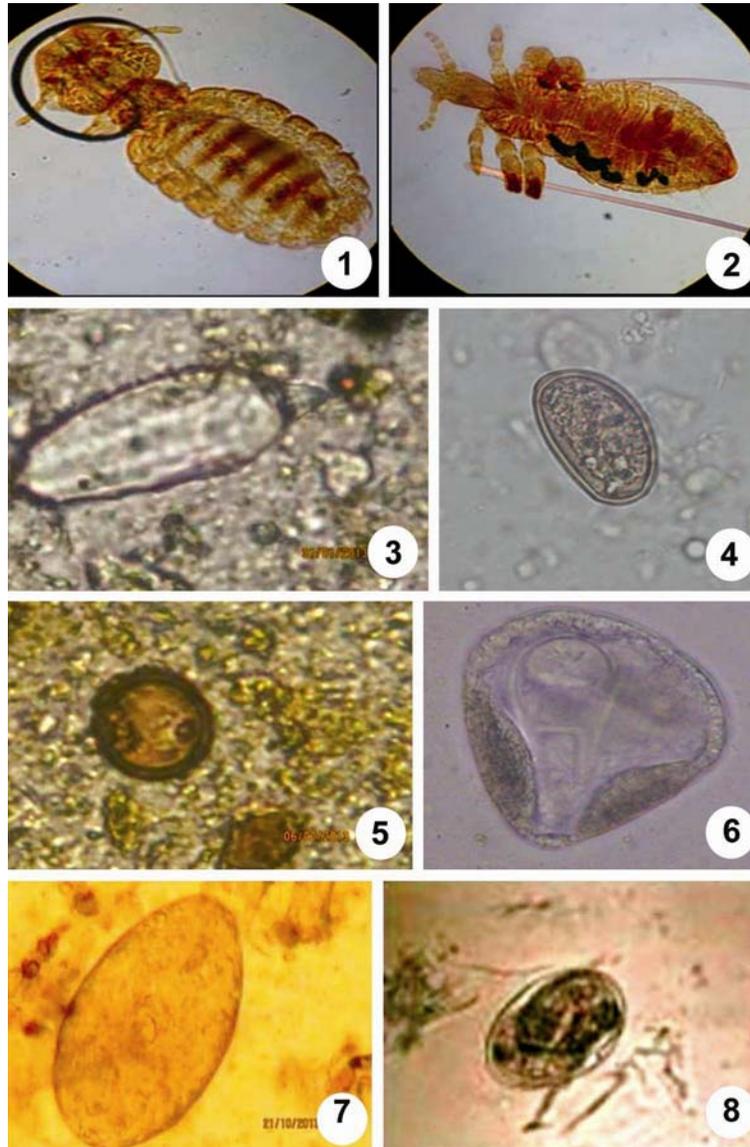
Group	Parasite species	No. of hosts infected	Range of EPG	Prevalence (%)	±SD
Trematode	<i>Fasciola hepatica</i>	26	43.33	100-400	±57.53
	<i>Dicrocoelium</i> sp.	7	11.67	100-100	±0.00
	<i>Schistosoma bovis</i>	23	38.33	100-500	±115.47
Cestode	<i>Taenia saginata</i>	31	51.67	100-700	±153.96
Cestode	<i>Moniezia expansa</i>	21	35	100-400	±19.24
Cestode	<i>Echinococcus</i> sp.	13	21.67	100-200	±134.71
Nematode	<i>Dictyocaulus</i> sp.	2	3.33	100-100	±68.04
	<i>Bunostomum</i> sp.	8	13.33	100-300	±13.06
	<i>Chabertia ovina</i>	12	20	100-200	±27.21
	<i>Trichuris</i> sp.	28	46.67	100-500	±95.25
	<i>Strongyloides</i> sp.	43	71.67	100-400	±54.41
	<i>Ostertagia</i> sp.	5	8.33	100-100	±68.04

In case of cestodes, highest prevalence was observed in *Taenia saginata* (51.67%), followed by *Moniezia expansa* (35%) and *Echinococcus* sp. (21.67%) [Table-3]. Standard deviation was highest in *Taenia saginata* (±153.96) and lowest in *Moniezia expansa* (±19.24).

Age related prevalence of gastro-intestinal parasites in sheep: Prevalence of helminth parasites were found higher (85.71%) in case of adult hosts (≥2 years), followed by young (80%) which were aged ≥2 years and then in lamb (64.28%), aged ≥1-2 years. Adults were more susceptible to gastro-intestinal helminth infection (85.71%) (Table 2).

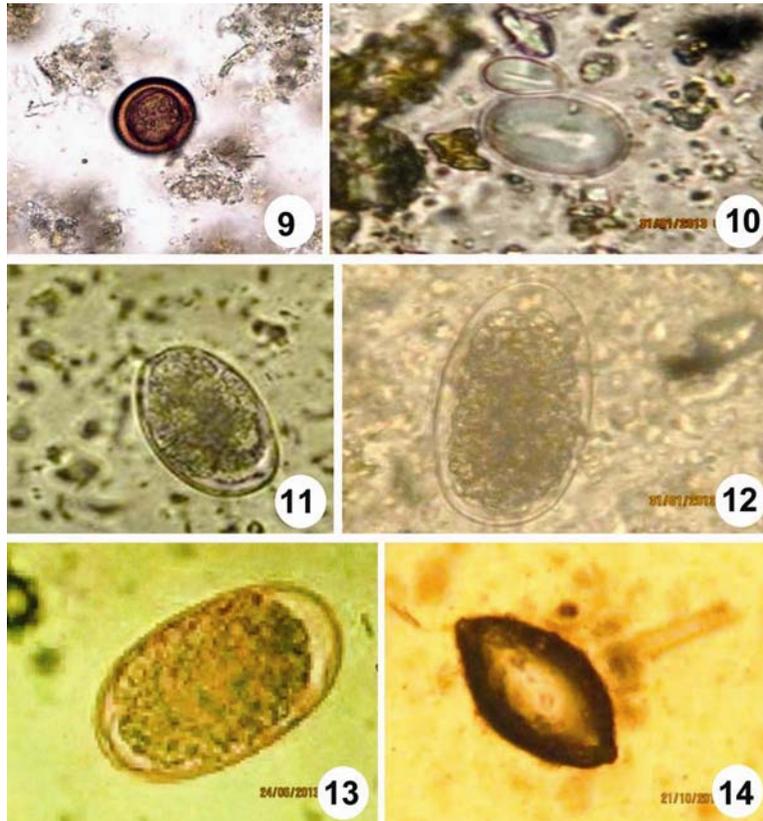
Prevalence of gastro-intestinal parasites in male and female sheep: It was detected that prevalence of helminth was higher in case of male sheep (81.58%) than female (72.73%). In case of male, prevalence of *Strongyloides* sp. was highest (65.79%), followed by *Taenia saginata* (44.74%), *Trichuris* sp. (42.11%), *Fasciola hepatica* (39.41%) and lowest prevalence was shown by *Dictyocaulus* sp. (2.63%). In case of female, highest prevalence was shown also by *Strongyloides* sp. (81.82%) followed by *Dictyocaulus* sp. (4.55%) (Table 4).

Seasonal prevalence of gastro-intestinal parasites in sheep: Prevalence of helminthes during summer, rainy and winter season were 80%, 60% and 95% respectively. During summer prevalence of Trematodes, cestodes and nematode parasite were 50%, 55% and 65% respectively, whereas prevalence of trematode, cestode and nematode was 40%, 45% and 60% respectively in rainy season and prevalence of trematode, cestode and nematode was 60%, 60% and 90%, respectively in winter season.



Plates 1-8: Image of egg of helminthes found in sheep. 1. Biting lice (*Damalinia caprae*). 2. Sucking lice (*Linognathus vituli*). 3. *Schistosoma bovis*. 4. *Dicrocoelium* sp. 5. *Taenia saginata*. 6. *Monizia expansa*. 7. *Fasciola hepatica*. 8. *Strongyloides* sp.

The prevalence of *Strongyloides* sp. was highest (71.67%) in sheep followed by *Taenia saginata* (51.67%), *Trichuris* sp. (46.67%), and *Fasciola hepatica* (43.33%), *Chabertia ovina* (20%), *Bunostomum* sp. (13.33%), *Ostertagia* sp. (8.33%) and lowest in *Dictyocaulus* sp. (3.33%). [Table 3].



Plates 8-14: 9. *Echinococcus* sp. 10. *Dictyocaulus* sp. 11. *Bunostomum* sp. 12. *Chabertia ovina*. 13. *Ostertagia* sp. 14. *Trichuris* sp.

Prevalence of ectoparasites in sheep was recorded 71.67% and it was found that sheep were infested with two arthropod parasite species, namely *Linognathus vituli* (61.67%) and *Damalinea caprae* (68.33%). El-seify *et al.* (1990) recorded 86.7% infestation with *L. africanus* and 13.3% infestation with *Bovicola caprae* in small ruminants of Egypt. Chakrabarty (1994) recorded 13.4% *Psoroptes* sp. infestation in small ruminants in India. The differences among the results of present and earlier studies might be due to variation in the geographical area, change in climatic conditions, variation in method of study, selection of sampling procedure and breed of sheep.

In the present observations the prevalence of ectoparasite infestation in sheep depended tremendously on the seasonal fluctuations of the year ($P < 0.01$). The co-efficient of correlation between the prevalence and intensity of ectoparasites was 0.95, which indicates that the prevalence and intensity of ectoparasite infestation was very strongly and positively correlated and these

two variables differed significantly ($P < 0.01$). The overall prevalence of ectoparasites was higher in Brazil, in rainy season (Brito *et al.*, 2005) and tick infestation was high in rainy season in India (Latha *et al.* 2004). During the present investigation, it was found that age of sheep had a significant impact on arthropod parasite infestation. Lambs were more susceptible (85.71%) to ectoparasite infestation followed by adult (80.95%) and young (56%). The prevalence of *Psoroptes* sp. was higher in young small ruminants (Chakrabarty, 1994), *L. africanus* infestation was the highest on the kids. It is hard to explain exactly the cause of higher frequency of ectoparasites in kids and older animals. It may be assumed that some hormonal influences may be associated with this phenomenon. High levels of prolactin and progesterone hormones could make the female more susceptible to any infection (Lloyd 1993). Moreover stress of pregnancy and lactation, which make the female more susceptible to infection.

Jugessur *et al.* (1998) reported 35.3% infected small ruminants. Yadav and Tandan (1989) reported 52.7% *Haemonchus* sp., 41.7% *Bunostomum* sp. and 3.5% *Trichuris* sp. infection in India. Rahman (1969), Qadir (1974), Nooruddin *et al.* (1987) reported same species of helminthes in sheep. *Moniezia* sp. was reported by Ndao *et al.* (1991).

Table 4. Prevalence of helminth parasite species infecting male and female sheep.

Name of parasites	No. of male infected	Prevalence (%)	No. of female infected	Prevalence (%)
<i>Fasciola hepatica</i>	15	39.41	11	50
<i>Dicrocoelium</i> sp.	3	7.89	4	18.18
<i>Schistosoma bovis</i>	13	34.21	10	45.46
<i>Taenia saginata</i>	17	44.74	14	63.64
<i>Moniezia expansa</i>	9	23.68	12	54.55
<i>Echinococcus</i> sp.	5	13.15	8	36.37
<i>Dictyocaulus</i> sp.	1	2.63	1	4.55
<i>Bunostomum</i> sp.	5	13.15	3	13.64
<i>Chabertia ovina</i>	7	18.42	5	22.73
<i>Trichuris</i> sp.	16	42.11	12	54.55
<i>Strongyloides</i> sp.	25	65.79	18	81.82
<i>Ostertagia</i> sp.	2	5.26	3	13.64

Impact of seasonal variation was apparent ($P < 0.01$) in different hosts. The value of co-efficient of correlation between the prevalence and intensity of parasites was 0.978 which indicates that the prevalence and intensity of helminth parasite infestation was very strongly positively correlated, so the two variables differed significantly ($P < 0.01$). Similar findings were reported by Islam (1989) and he recorded peak occurrence of *Trichuris* sp in winter. In contrast Shahadat (2003) found higher prevalence during rainy season (75.53%).

Shahadat *et al.* (2003) in Bangladesh reported younger (68.6%) sheep were more susceptible than adults (6%) in *Strongyles* infection. Uddin (2006) in Bangladesh reported in *Paramphistomum* sp. infection higher prevalence observed in adult animals (89.58%) followed by young animals (78.57%). Mollah *et al.* (1970) found no significant differences in the percentage of infestation between young and adult animals.

Rearing and raising sheep in our country is a way to get economic support for the people especially living in rural areas. The parasitic disease of sheep may cause profound economic loss due to reduced growth, damaged skin, hide and wool, reduced milk production, morbidity, mortality of lamb etc.

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(Manuscript received on 8 October, 2013; revised on 30 March, 2014)